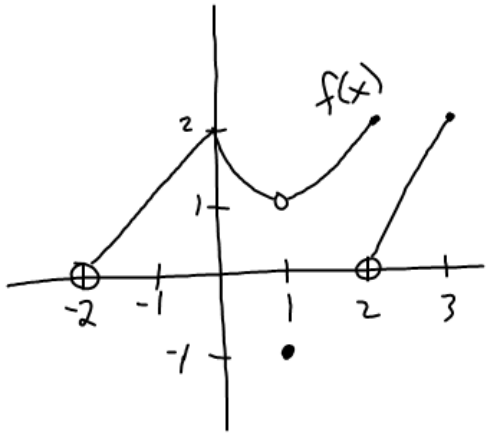
① Find the limit algebraically

(a) $\lim_{x\to 2} \frac{x^2-3x+2}{x^2-4}$

$\frac{(x-2)(x-1)}{(x-2)(x+2)} = \frac{(x-1)}{(x+2)} = \frac{1}{4}$

(b) $\lim_{x\to 0} \frac{3\sin(4x)}{\sin(3x)} = \lim_{x\to 0} \frac{3}{\sin 3x} \cdot \frac{\sin 4x}{1}$

② Write all the statements you can about the figure below and limits.



- $\lim_{x\to 1^-} f(x) = 1$
- $\lim_{x\to 2} f(x)$ undef.
- $\lim_{x\to 2^-} f(x) = 2$
- $\lim_{x\to 2^+} f(x) = 0$
- $\lim_{x\to 1^+} f(x) = 1$
- $\lim_{x\to 1} f(x) = 1$

$\lim_{x\to -2^+} f(x) = 0$

$\lim_{x\to 3^-} f(x) = 2$

b) $\lim_{x \to 0} \frac{3\sin 4x}{\sin 3x} =$

$$\left(\frac{3}{\sin 3x} \cdot \frac{\sin 4x}{1}\right) \cdot$$

$$\left(\frac{\sin 4x}{1} \div \frac{\sin 3x}{3x}\right) \cdot \frac{x}{x} \cdot \frac{4}{4}$$

$$4\frac{\sin 4x}{4x} \div \frac{\sin 3x}{3x}$$

$$4 \cdot \frac{\sin 4x}{4x} \div 1$$

$$4 \times 1 \div 1 = 4$$

$$\lim_{x \to 0} \frac{3\sin 4x}{\sin 3x} = 4$$

$$\lim_{x\to\infty} \frac{\cos x}{x}$$

$$-1 \le \cos x \le 1$$

$$\frac{1}{x} \cdot \cos x$$

$$\frac{-1}{x} \le \frac{\cos x}{x} \le \frac{1}{x}$$

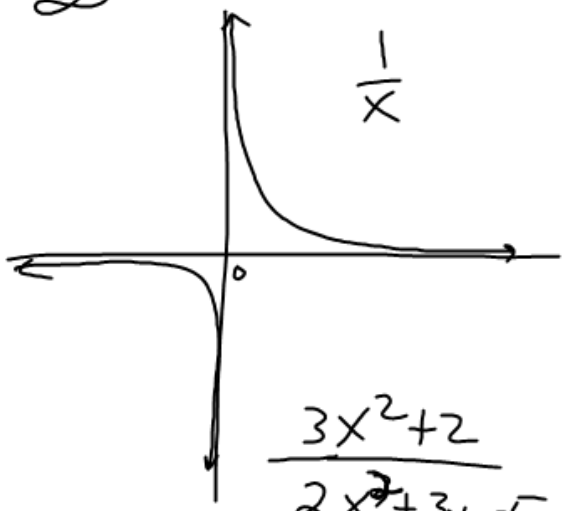
$$\lim_{x\to\infty} \frac{-1}{x} = 0$$

$$\lim_{x\to\infty} \frac{1}{x} = 0$$

$$\Rightarrow \lim_{x\to\infty} \frac{\cos x}{x} = 0$$

Asymptotes

$R = \frac{N(x)}{D(x)}$



Vert. Asymp. when $D(x) = 0$

Horz. Asymp. 3 Rules

- when top power = bottom power
  $\Rightarrow$ ratio of Leading coefficients
- when top > bottom power
  $\Rightarrow$ 1 bigger slant
  $\Rightarrow$ otherwise No asympt.
- when top < bottom
  $\Rightarrow y = 0$

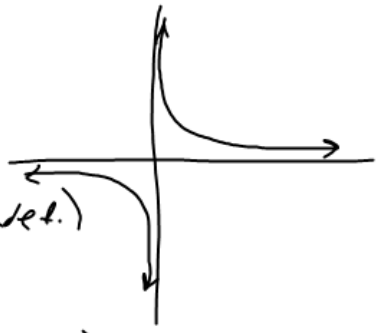
$\frac{3x^2+2}{2x^2+3x-5}$

end behavior

$\frac{3x^2}{2x^2} = \frac{3}{2}$

$\frac{3x^3+2x^2+5}{2x^5-7}$

$f(x) = \frac{1}{x}$



$\lim_{x \to 0^-} f(x) = -\infty$ (undef.)

$\lim_{x \to 0^+} f(x) = \infty$ (undefined)

Sect. 2.2

#2-4, 7, 9, 13, 16, 21,

27, 30, 35-38, 45,
(no calc)

53-55

$x \to \pm\infty$

look at $\frac{1}{x}$ as $x \to 0$

$f(x) = \sin\frac{1}{x}$

$\lim_{x \to \infty} f(x) = \lim_{x \to 0} f(\frac{1}{x})$

$\sin\left(\frac{1}{\frac{1}{x}}\right) = \sin x$

look at $\sin x$ $x \to 0$

Same $\sin\frac{1}{x}$ $x \to \infty$

#2 $\lim_{x \to \infty} \frac{\sin 2x}{x}$

$\lim_{x \to 0} \frac{\sin\left(2\left(\frac{1}{x}\right)\right)}{\left(\frac{1}{x}\right)}$